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Trust, feasibility, and priorities influence Swedish dairy farmers' adherence and nonadherence to veterinary advice

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ABSTRACT

The problem of nonadherence to advice is recognized in several professional relationships, including the veterinarian-client relationship. A better understanding of farmer perspectives may help to improve efficiency in veterinary herd health management. This study aimed to qualitatively and quantitatively describe farmers' reasons for adherence and nonadherence with veterinary recommendations regarding preventive herd health measures. We carried out structured telephone interviews about implementation of preventive measures with owners or staff of 163 dairy farms and 6 beef farms. The farms had received an advisory visit by their veterinarian (n = 36), who had documented the preventive measures they had recommended. The interviewer noted verbatim responses to reasons for implementing preventive measures fully, partially, or not at all, and we analyzed these responses thematically. We also conducted a quantitative analysis, in which we calculated descriptive statistics of the proportions of different categories of reasons stated by the farmers. Altogether, 726 preventive measures (range per farm 1 to 17; median 3; interquartile range 2 to 6) were documented. We identified 3 organizing themes related to adherence or nonadherence with veterinary advice: trust, feasibility, and priorities. Overall, the most commonly stated reasons related to trust (in the veterinarian, in the advisory process, or in individual preventive measures). The most common reasons not to follow the recommended advice were related to feasibility. Based on the results, we recommend that, to improve adherence to their advice, veterinarians pay increased attention to farmers' needs, priorities, goals, and motives, as well as to farmers' perceptions of the effectiveness of individual preventive measures. We also recommend that veterinarians need to increase their focus on recommending preventive measures that are practically feasible to implement on farms.
Key words: compliance, implementation, reason, veterinary herd health management

INTRODUCTION

Although diagnosis and treatment of sick animals still form the main tasks for many cattle veterinarians (Hall and Wapenaar, 2012), advisory services now constitute an increasing proportion of work. Farmers perform a wide range of preventive measures themselves to reduce disease and improve animal welfare and use various sources of knowledge support (Svensson et al., 2018), but generally welcome and listen to advice from their veterinarian (Pothmann et al., 2014; Frössling and Nöremark, 2016).

In Sweden, systematic veterinary herd health management (**VHHM**) programs have been in operation for over 20 years (Hallén-Sandgren and Olsson, 1994; Hallén-Sandgren, 1998), aiming to reduce the incidence of clinical and subclinical disease and optimize production. These programs include clinical examinations of animals as well as examinations of health records, management routines, and animal resources such as access to water and feed, and cow comfort. The most common VHHM program is Health Package—Milk, organized by the Swedish dairy association Växa Sverige. Biosecurity programs, udder health programs, and programs for herd health as a prerequisite for conditional delegated medicine use are other common VHHM programs in Sweden.

Sweden has a long tradition of voluntary biosecurity programs (SVA, 2017). In 2018, approximately 57% of Swedish dairy herds were affiliated with a voluntary biosecurity program, Safe Farm (Ohlsson and Andersson, 2017), directed toward salmonella and other pathogens (S. Andersson, Växa Sverige, Stockholm, Sweden, personal communication). Legislation requires that, for dairy farmers to be able to start a medical treatment

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in their animals (conditional delegated medicine use), farms must sign a contract with a veterinarian with special training in VHHM for regular visits for follow-up treatments and to encourage preventive work in the herd.

Apart from VHHM programs, veterinarians also offer less-systematic advisory visits. These often comprise more short-term efforts directed at solving specific health problems or involve a general advisory discussion relating to a specific focus area. Advisory discussions are also often part of pre-booked service visits (e.g., when the veterinarian performs reproductive examinations or dehornings) or control visits (e.g., to herds affiliated with voluntary control programs or licensed to practice do-it-yourself artificial insemination). Preventive measures identified in different VHHM services are quite commonly documented in health plans which also specify the targeted aims for the preventive work on the farm.

Many preventive measures recommended by dairy cattle veterinarians are never implemented (Sorge et al., 2010; Whay et al., 2012; Sjöström et al., 2019). Average compliances of 33 to 67% have been reported by Sorge and colleagues (2010), Tremetsberger and colleagues (2015), and Sjöström and colleagues (2019). Even with a recognition of low adherence, literature on dairy farmers' reasons for adherence or nonadherence is scarce. Most publications deal with general motivational factors that drive farmers to improve animal welfare (Hansson and Lagerkvist, 2016) or join VHHM or biosecurity programs (Kristensen and Enevoldsen, 2008; Ritter et al., 2015). Other studies have investigated the effects of using particular tools such as benchmarking (Sumner et al., 2018) or economic figures (Anneberg et al., 2016) on dairy farmers' decision-making, with regard to improving animal management. Motivators and barriers to implementing measures in certain focus areas, such as biosecurity (Toma et al., 2015; Brennan et al., 2016), claw health (Bruijnis et al., 2013; Relun et al., 2013), or mastitis (Valeeva et al., 2007), have been the focus of a few studies. Studies that report reasons for adherence and nonadherence in actually implementing veterinary recommendations in more general VHHM services are particularly scarce.

To help veterinarians better understand how to improve their services to facilitate greater adherence to recommendations, it is important to gain further insight into farmer perspectives on recommendations in VHHM. The aim of this study was to qualitatively and quantitatively investigate and describe dairy farmers' reasons for adherence and nonadherence to veterinary recommendations regarding preventive measures.

MATERIALS AND METHODS

This study involved Swedish cattle farms that, in 2016 or 2017, had received an advisory visit by one of 36 cattle veterinarians who were participating in a larger research project on veterinary communication. As part of this larger project, participating veterinarians made advisory visits to farms, where they recorded their conversations with clients, stated the focus areas they were targeting with their recommendations, and documented the preventive measures discussed. Between 3 and 6 mo after the first visit, veterinarians revisited each farm to review the implementation of recommendations with the farm owner, farm manager, or animal caretaker. This person was then contacted by a researcher 1 to 4 weeks later for a telephone interview about the implementation. The present study analyzed the data from these telephone interviews and was granted ethics approval by the Regional Ethical Review Board in Uppsala (reference number 2016/041). The following 2 sections describe how recruitment of veterinarians and farms was performed in the larger research project.

Participating Veterinarians

We contacted the 2 largest employers of Swedish dairy cattle veterinarians, the District Veterinary Organization (Swedish Board of Agriculture) and the regional dairy associations, about their interest in allowing their employed veterinarians to join the project (which included a 6-mo communication course). Dairy cattle veterinarians involved in VHHM were identified as employees who were taking or had taken a course licensing them to sign contracts with dairy farms regarding conditional delegated medicine use in their VHHM work according to Swedish legislation (District Veterinary Organization n = 56; regional dairy associations n = 23). Those veterinarians allowed by their employers to participate we contacted via telephone, to inform them about the project and invite them to participate. In addition, we identified self-employed dairy cattle practitioners involved in VHHM based on enrollment in the main VHHM network (n = 18), informed them about the project via e-mail, and invited them to participate. In total, 42 veterinarians volunteered and, of these, 36 (20 district veterinarians, 11 veterinarians from regional dairy associations, and 5 self-employed practitioners; i.e., approximately 37% of all Swedish dairy cattle veterinarians involved in VHHM) remained in the project throughout its full course of 2 years and were included in the present study.

Participating Farms

Participating veterinarians chose a convenience sample of farms from among their clients, for which they were asked to include farms that fulfilled the following inclusion criteria:

(1) a farm where the veterinarian would carry out an advisory visit of some kind,
(2) for which it was possible to write a health plan and for which the farm expressed an interest to the veterinarian in following up at a later visit, and
(3) where the owner, manager, or staff agreed that the veterinarian could record the veterinary-client conversation.

Each veterinarian was requested to include 5 farms, preferably dairy farms, although beef farms were also used.

Veterinarians discussed the purpose and design of the project with farm owners and staff and invited them to participate. Farmers and staff who agreed to participate provided written consent for sharing data about the farm and for participating in interviews. Farm owners suggested a person from the farm with relevant knowledge to be interviewed and provided veterinarians with contact information.

Interviews

The first author (a veterinarian experienced in VHHM) conducted all telephone interviews, except for 9 that were performed by a master's student in veterinary medicine. Interviews lasted between 10 and 15 min. Before the start of each interview, the interviewer informed the interviewee that his or her answers would only be handled by the researchers in the project group and that results would be reported at group level or by anonymized quotes, so that neither the veterinarian nor any other person could trace information back to a specific individual.

The interviews followed a structured protocol and consisted of 3 parts. The first questions concerned characteristics of the participant (age, gender, role on the farm, education, experience working with animals). The second section dealt with the preventive measures discussed, the participant's satisfaction with implementing these preventive measures, and the degree of implementation according to the participant. In the third section, participants were asked to use a Likert scale (1 through 6) to grade how influential they perceived their personal effect to be on the implementation of the recommended preventive measures on the farms. The third section also included the following 3 questions about reasons for adherence and nonadherence:

1–2. You implemented this/these measure(s) fully/partially: *[measures listed during the interview]*. In your opinion, what are the main reason(s) why you have chosen to implement these specific measures (fully/partially)?
3. You did not implement this/these measure(s) at all: *[measures listed during the interview]*. In your opinion, what are the main reason(s) why you chose not to implement these measures?

During the interviews, answers were manually recorded. Answers to questions concerning reasons were noted word-for-word by the interviewer while the participant was speaking. All data were then transferred to a Netigate questionnaire (https://www.netigate.net/sv/) and were exported to Microsoft Excel (Microsoft Corp., Redmond, WA). Farms were numbered randomly from 1 to 169.

Data Analysis

Characteristics. Using Microsoft Excel, we calculated descriptive statistics for (1) number of recommended preventive measures, (2) scores for perceived personal influence on implementation, (3) focus areas, and (4) degree of implementation. Focus areas were merged into categories.

Reasons for Adherence and Nonadherence. Data on reasons for adherence and nonadherence were analyzed both qualitatively using thematic analysis and quantitatively.

In the thematic analysis, we analyzed the texts generated from the answers to questions 1 to 3 using thematic analysis according to the recommendations by Attride-Stirling (2001), who suggests a 6-step procedure. We adopted an inductive approach involving the following steps. (1) Code lists were identified separately by the 3 Swedish-speaking authors (1 veterinarian, 1 agronomist, and 1 psychology researcher), who then discussed these until agreement was reached on a single coding framework (Kurasaki, 2000). (2) Based on this coding framework, the authors identified basic themes in the texts from each interview (each farm) using Microsoft Excel. Basic themes were identified for each meaning unit (single words, whole sentences, or parts of sentences from the interview text that expressed a distinct and coherent meaning or content corresponding to one reason), to highlight their particular denotations. Several basic themes could apply to a single meaning unit. (3) Basic themes were arranged into larger organizing themes by 2 authors (1 veterinarian and 1 psychology

researcher) separately. All 3 Swedish-speaking authors then discussed these organizing themes until agreement was reached (Kurasaki, 2000). Finally (4 and 5), the organizing themes and how they were connected were described and summarized, leading to (6) interpretation of the identified patterns for future advice on how to improve farmers' adherence to veterinary recommendations.

In the quantitative analysis, for each of the questions detailing reasons, we used Microsoft Excel to calculate the proportion of farms that had stated reasons, which were assigned to a particular basic theme, along with the total number of reasons given.

RESULTS

Characteristics

Altogether, 169 farms (163 dairy, 4 cow-calf beef, 2 specialized beef) were revisited by the veterinarians, who each initially had made advisory visits to between 1 and 6 (mean 4.7) farms. Types of visits are shown in Table 1.

The number of preventive measures discussed, recommended, or agreed per farm varied between 1 and 17 (median 3; interquartile range 2 to 6). Veterinarians documented a total of 726 preventive measures to be taken by farmers. The preventive measures discussed, recommended, or agreed on farms related to between 1 and 4 (mean 1.5) different focus areas. On 64 (38%) farms, the preventive measures related to multiple focus areas. The 2 most common focus areas were calf health, discussed on 70 farms (41%), and udder health, discussed on 67 farms (40%). Other preventive measures focused mainly on management of transition cows or feeding [31 farms (18%)], fertility [24 farms (14%)], claw health [18 farms (11%)], young stock management [16 farms (9%)], and biosecurity [12 farms (7%)].

We performed most interviews [133 (79%)] with the owner of the farm; 20 (12%) were with the farm manager, and 15 (9%) were with another staff member. Most interviewees [159 (94%)] considered themselves to have substantial influence on the implementation of preventive measures on the farm. The median score (Likert scale 1 to 6) for their perceived influence was 6 (interquartile range 5 to 6).

The farms fully implemented a mean of 47% of suggested preventive measures, and 25% of measures were partially implemented. A mean of 22% of measures were not implemented. Of farms where veterinarians documented preventive measures relating to calf health, 123 (73%) implemented at least one measure fully. On farms where veterinarians documented measures to improve udder health, 18 (70%) implemented at least 1 measure fully. The percentage of fully implemented measures relating to the 2 main focus areas varied between 0 and 100 and were on average 43% (calf health) and 45% (udder health). The mean percentage of fully implemented measures for the other focus areas were 31% (fertility), 44% (claw health), 55% (biosecurity), 58% (feeding or management of transition cows), and 58% (young stock management).

Thematic Analysis

We identified 3 organizing themes for adherence and nonadherence to suggested measures: trust, feasibility, and priorities (Figure 1). The theme of trust was built on "good or poor veterinary service": among the reasons farmers stated for adherence to veterinary advice were that the farmer trusted the veterinarian and his or her advice and that the veterinarian had made the farmer aware that the recommended preventive measure addressed a factor of importance for animal health. Other reasons why farmers followed veterinary recommendations were that the veterinarian encouraged and inspired the farmer. Positive experiences from the process of establishing the health plan were also addressed (e.g., that farmers perceived the suggested preventive measures to be effective, that the veterinarian sug-

Table 1. Distribution of types of advisory visits made by 36 veterinarians to 169 Swedish cattle farms

Type of visit	Number (%) of farms
Service visits with associated advisory discussions	44 (26.0)
Herd health investigations related to acute health issues	32 (18.9)
VHHM[1] related to conditional delegated medicine use visits	32 (18.9)
Health Package—Milk (VHHM program)	17 (10.1)
Safe Farm (biosecurity program)	15 (8.9)
Advisory discussions in relation to control visits[2]	10 (5.9)
Visits with general advisory discussion	10 (5.9)
Advisory visits made solely for the purpose of the project[3]	9 (5.3)

[1]Veterinary herd health management.

[2]E.g., to herds affiliated with voluntary control programs or licensed to practice do-it-yourself AI.

[3]These visits would not have occurred if the veterinarian had not been engaged in the project.

gested measures farmers had also conceived themselves, that the veterinarian acknowledged the farmer's right to make decisions as well as the farmer's competence and suggestions). Among reasons related to a "poor veterinary advisory service" were that the veterinarian had not fulfilled what the farmer had perceived as a promise (e.g., to supply the information needed, to take samples or perform examinations needed) or had not helped in efforts to work with the health issue. Other reasons relating to "poor advisory service" were that farmers did not agree with the veterinarian that measures were needed, that farmers did not understand why a particular problem needed action, or that the veterinarian had not offered any practical solutions to the problem. Farmers sometimes were not convinced that the suggested preventive measure would be effective, they did not understand why a particular measure had been recommended by their veterinarian, or they actually had tried to implement the measure and had demonstrated that the suggested measure did not have the desired effect:

> "The vet wanted to start with the calves, and we wanted to start with why the cows did not get pregnant. I didn't get the answer I wanted from the vet." (Farm 88)

Several reasons related to the feasibility of the preventive measures recommended by the veterinarian (Figure 1). Farmers mentioned recommended management routines that fitted nicely with the ones they currently used as a reason for adherence. Farmers found suggested preventive measures off-putting if they meant continuous work (e.g., measures that needed to be repeated often, such as milk sampling of cows with high SCC). Some of the external conditions that were related to decreased adherence included queues for slaughterhouses (making it difficult to adhere to recommendations to cull cows), sale firms that were unable to deliver equipment in a timely manner, difficulties in procuring the services of a claw trimmer, and poor harvesting conditions. Other reasons affecting the feasibility of recommendations were personal considerations (e.g., the owner being ill) or that farmers were unsure whether suggested measures applied to current legislation and regulations (e.g., certification programs).

The theme of priority was built mainly on farmers' perceived severity of the disease problem and perception about the need to implement preventive measures (Figure 1). Other reasons concerned farmers' relation to their animals: attachment to their animals made farmers less adherent to veterinarians' recommendations to cull animals to reduce spread of infections. Farmer-animal relations were also mentioned as reasons for adherence:

> "We want it to be as good as possible for the animals and to be able to help them." (Farm 111)

We also grouped reasons related to intrinsic conditions (e.g., low motivation, farmers identifying other solutions that worked better for them) into the priority theme.

Farmers mentioned lack of time as an important reason for nonadherence with veterinary advice, whereas they implied that if a recommendation meant a work task could be carried out in a more time-efficient manner, this was a reason to prioritize implementation. Leadership and staff problems, such as lack of staff, poor education, miscommunication among persons involved, and different priorities, were other reasons reported by the farmers.

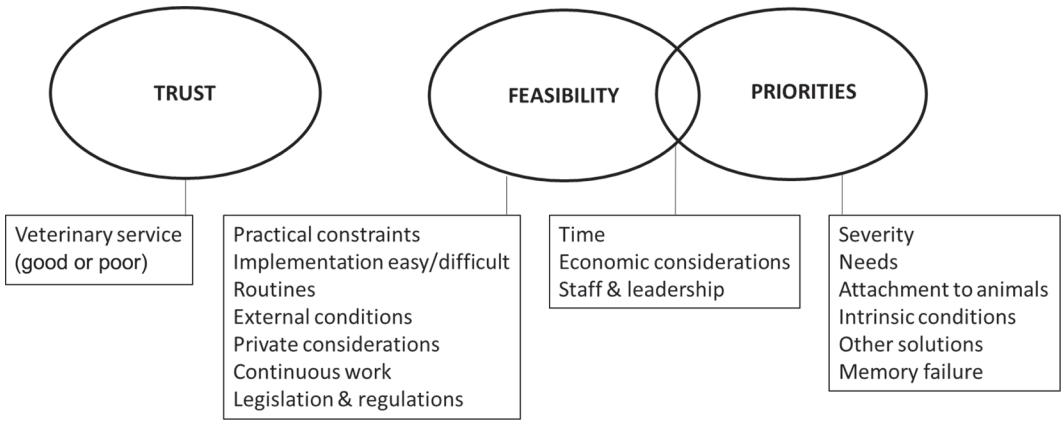

Figure 1. Thematic network, illustrating basic themes (lowercase) and organizing themes (uppercase) identified by thematic analysis of farmer reasons for adherence and nonadherence with veterinary advice on 169 Swedish dairy farms.

Table 2. Distribution of the 6 most commonly stated categories of reasons for full implementation of preventive measures suggested by veterinarians among 132 Swedish cattle farms, and related organizing themes

Reason	No (%) of farms	Related organizing theme
Good veterinary advisory service	59 (44.7)	Trust
High perceived severity of health issue	48 (36.4)	Priority
Action easy to perform	40 (30.3)	Feasibility
High perceived need	31 (23.5)	Priority
Attachment to animals	28 (21.2)	Priority
Economic considerations	25 (18.9)	Feasibility

Quantitative Analysis

Of the participating farms, 132 (78%) fully implemented 1 or more of the veterinarian's suggested preventive measures. Of these, 83 (49%) mentioned animal health or animal welfare in some context in their explanation as to why they had chosen to carry out the particular measure. Thirty-five farms (21%) mentioned reasons related to business development, such as the perception that the measures would reduce workload or improve profitability, were beneficial for the whole enterprise, or strengthened weak areas of the business. Farms reported 252 different reasons for implementation, 165 reasons for nonimplementation, and 244 reasons for partial implementation. The most commonly reported categories for each result are shown in Tables 2, 3, and 4. Of the participating farms, 112 (72%) reported partial implementation and 93 (55%) reported nonimplementation of one or more of the preventive measures suggested by the veterinarians.

Practical problems in implementing suggested preventive measures were the most common reasons for nonadherence. Of the 244 reasons given by farmers as to why preventive measures were partially implemented, more dealt with nonadherence than with adherence. Fewer farms chose to give reasons as to why they had tried to implement suggested measures or commented on both adherence and nonadherence. Personal considerations were reported by 13 farms (11.6%), and 11 (9.8%) mentioned leadership and staff problems as reasons for their adherence and nonadherence to veterinary advice.

DISCUSSION

We identified trust, feasibility, and priority as organizing themes for the main reasons for farmers' adherence and nonadherence with veterinary recommendations. The reasons related to the organizing theme of trust dealt with good or poor veterinary service: trust in the veterinarian, in the advisory process, or in the individual preventive measures. It is well known that external influences from social referents such as veterinarians and colleagues can influence farmers' management decisions (Vaarst et al., 2007; Ellis-Iversen et al., 2010; Roche et al., 2015). Factors related to the veterinary advisory service farmers received, such as trust in the veterinarian or the advice (interpreted as indicating good advisory services), were mentioned as main reasons for full implementation of suggested preventive measures by 45% of farmers. This belief in the veterinarian shows that veterinary professionals play an important role in supporting farmers to implement preventive measures. Brennan and colleagues (2016) have previously reported veterinarians' recommendations to be an important motivator to implementing biosecurity measures on UK dairy farms. We also found that nonadherence to veterinary recommendations was related to aspects of poor veterinary advisory service, such as feeling a lack of support. This indicates substantial room for improvement of veterinary services.

Our results accord well with findings by Svensson and colleagues (2018), who identified that farmers considered trust between the farmer, farm staff, and veterinarian to be crucial for VHHM. Vaarst and colleagues (2007) also concluded that mutual trust between participants was a key factor to the success of experiential,

Table 3. Distribution of the 6 most commonly stated categories of reasons for nonimplementation of preventive measures suggested by veterinarians among 93 Swedish cattle farms and related organizing themes

Reason	No (%) of farms	Related organizing theme
Practical constraints	29 (31.2)	Feasibility
Poor veterinary advisory service	27 (29.0)	Trust
Time	27 (29.0)	Feasibility
Low perceived need	23 (24.7)	Priority
Economic considerations	14 (15.1)	Feasibility
External conditions	10 (10.7)	Feasibility

Table 4. Distribution of the 6 most commonly stated categories of reasons for partial implementation of preventive measures suggested by veterinarians among 112 Swedish cattle farms and related organizing themes

Reason	No (%) of farms	Related organizing theme
Practical constraints	45 (40.2)	Feasibility
Perceived need	32 (28.6)	Priority
Veterinary advisory service	30 (26.8)	Trust
Time	27 (24.1)	Feasibility
Economic considerations	19 (17.0)	Feasibility
Match with farm routines	18 (16.1)	Feasibility

participatory learning groups of dairy farmers. This was in contrast to the farmers' experiences of working with veterinarians, where an asymmetric power relationship typically existed and the farmer was supposed to be the one learning from the professional "expert" (Vaarst et al., 2007). Participants in the present study stated that the veterinarian acknowledging the farmer's right to make decisions, as well as the farmer's competence and suggestions, were reasons for adherence, in line with the findings by Svensson and colleagues (2018) that failure to do these things were a barrier to hiring veterinarians for VHHM. That the veterinarian had a different view than the farmer or farm staff concerning the need for action toward a particular problem was mentioned as a reason for nonadherence. Involving and listening to the farmer in the process of the veterinary advisory service appears to be important for adherence to recommendations. The results of our study suggest that it may be beneficial for veterinarians to give further attention to collaborative discussions of why and how suggested preventive measures may be effective to improve animal health—the trust in or perceived effectiveness of the individual measure was demonstrated to be an important factor for adherence. Sjöström and colleagues (2019) found that a participatory approach to VHHM resulted in high rates of implementation.

Barriers to feasibility of suggested preventive measures (practical constraints, time constraints, economic considerations, external conditions such as difficulties in procuring service for milking robots or claw trimming, difficulties in trying to fit measures into previously established routines, etc.) were the most-cited reasons for nonadherence. Available space, barn layout, and other farm-specific limitations were factors that made suggested recommendations difficult or impossible to implement, according to the farmers. This is in accordance with findings of Sorge and colleagues (2010), who reported the main challenges to implementation of biosecurity recommendations regarding Johne's disease to be space or barn layout, difficulties in changing established routines, cost, time limitations, and labor availability. Practical challenges have also been reported as a reason for French farmers to abandon the use of hoof mats for the control of digital dermatitis (Relun et al., 2013). Perceived practicalities of biosecurity measures also had a strong effect on willingness to control *Escherichia coli* O157 (Toma et al., 2015) and on making on-farm changes to control Johne's disease (Roche et al., 2015). Derks and colleagues (2012) also identified the less-than-practical nature of veterinary advice as a common reason for nonadherence by farmers and reported that when farmers were not able to fit measures into their daily routines, or they perceived advice as useless, they did not follow that advice.

Dairy farmers have reported that they perceive veterinarians to have insufficient knowledge about practical farm routines and farm economy, and therefore they do not realize that many of their recommendations are not practically and economically realistic (Svensson et al., 2018). The present study also suggests that veterinarians increasing their knowledge in these areas might improve the feasibility of their recommendations and could be one way to improve adherence. Another suggestion would be for veterinarians to assume less of the role of the "expert" and more the role of a team player, investigating and acknowledging the farmer's perceptions of the feasibility of potential preventive measures and, together with the farm owner and staff, prioritizing those preventive measures that are easy to perform on that particular farm. A more client-oriented and less paternalistic approach has also suggested by Bard and colleagues (2017) to increase efficiency in veterinary services.

The results presented here suggest that farmers choose to implement measures they themselves believe will be effective, along with measures that address areas they consider important to improve their farm, given the goals they have for the operation. Farmers are therefore more likely to adhere to veterinary recommendations that are in line with their own priorities. Hence, it would behoove veterinarians to develop a better understanding of farmer priorities and goals; this has previously been identified as a weak point in their services (Hall and Wapenaar, 2012; Derks et al., 2013; Svensson et al., 2018). The reluctance of farmers to implement measures when they did not believe them to be effective has also previously been documented (Jansen et al., 2010; Relun et al., 2013).

The perception of a very severe animal health issue and a high perceived need to address an issue on a farm were commonly cited reasons for farmer adherence to suggested measures and also related to the organizing theme of priority: low perceived need was demonstrated to be a reason for farmers' nonadherence with veterinary recommendations. This is in accordance with findings by Bruijnis and colleagues (2013), who reported that farmers who stated that their cows had poor foot health—and particularly farmers who had experienced worsened claw status in their herd during the past 5 years—had greater intentions to take action to improve foot health.

The reasons for adherence and nonadherence that we identified in this study fit well into the Health Belief Model, a psychosocial model for explanation and prediction of human preventive health behavior (Janz and Becker, 1984). This model identifies 2 main determinants of preventive behavior in relation to human health: (1) a person's estimate of or belief in a personal threat of

illness, and (2) that person's belief in the effectiveness of a preventive behavior to reduce the threat. The perception of a personal threat is considered to be related to 2 of the dimensions of the model: perceived susceptibility and perceived severity. Alternatively, the belief in the effectiveness of a preventive behavior is related to 2 other dimensions: the perceived barriers to and benefits of such a behavior. As previously discussed, the severity of the cattle health issue was cited by farmers in this study as one of main reasons for adherence or nonadherence to veterinary suggestions, as was trust in the effectiveness of individual measures. Low feasibility of a suggested measure was also identified as a main barrier, and the main motivators—improved animal health and welfare, and business development—may also be described as main benefits. The Health Belief Model, therefore, may be used as an aid to help veterinarians design VHHM recommendations for individual farms to optimize adherence. Use of the Health Belief Model has also been suggested by Jansen and Lam (2012) as well as Ritter and colleagues (2016), all of whom found the model to be relevant to explaining dairy farmer behavior (in relation to mastitis prevention and control of infectious diseases in their animals).

The farms and advisory visits surveyed in the present study were a convenience sample chosen by the participating veterinarians, with one inclusion criterion being that the farm was willing to allow recording of an advisory conversation. Many veterinarians had great difficulty in identifying 5 advisory conversations to record, and some of the conversations would most likely not have occurred if it were not for this project. This may have biased the types of visits that were surveyed, as by increasing the proportion of less-systematic advisory visits compared with a randomly selected sample of farms and visits. It is also likely that the veterinarians in this study preferred to have conversations with farmers whom they believed had a positive view of their services. This might have resulted in farmers reporting greater adherence to veterinary advice and may have resulted in more reported reasons relating to good-quality advisory services than if the visits had come from a randomly selected sample. Hence, the choice of sample in this study may have affected the distribution of the categories of reasons. However, the aim of this study was to describe farmers' reasons for adherence and nonadherence to veterinary advice, and, as such, all reported factors represent a valid view of these reasons.

We wanted to interview persons who knew the reasons for implementing or not implementing veterinarians' recommendations, and so we asked farm owners to suggest people with that knowledge. Most of the interviews (79%) were with the owners of farms, but farm managers (12%) and other staff members (9%) were also among our interviewees. We cannot exclude the possibility that answers would have been different if we had interviewed other persons on the farms. However, due to small numbers, we were not able to conduct separate analyses for farm owners, managers, and other staff.

CONCLUSIONS

Farmers reported several reasons to adhere or not adhere to veterinarians' recommendations; those relating to trust in the veterinarian and in the effectiveness of the suggested measures, as well as those relating to feasibility and their own priorities and needs were reported as being vital. Results indicate that for veterinarians to improve adherence, they must increase their attention to farmers' needs, priorities, goals, and motives, as well as to farmers' perceptions of the effectiveness of individual preventive measures. Veterinarians also need to increase their knowledge about practical farm routines and costs and acknowledge the expertise of farmers, so that VHHM discussions can focus on preventive measures that are practically feasible to implement, that can fit easily into daily farm routines, and that will result in considerable measurable impact, given the cost and time allocations required to enact them.

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